Jan. 11, 1938. J. H. FRIEDMAN 2,104,944

MACHINE FOR MAKING BOLTS

Filed Nov. 13, 1935 4 Sheets-Sheet 1

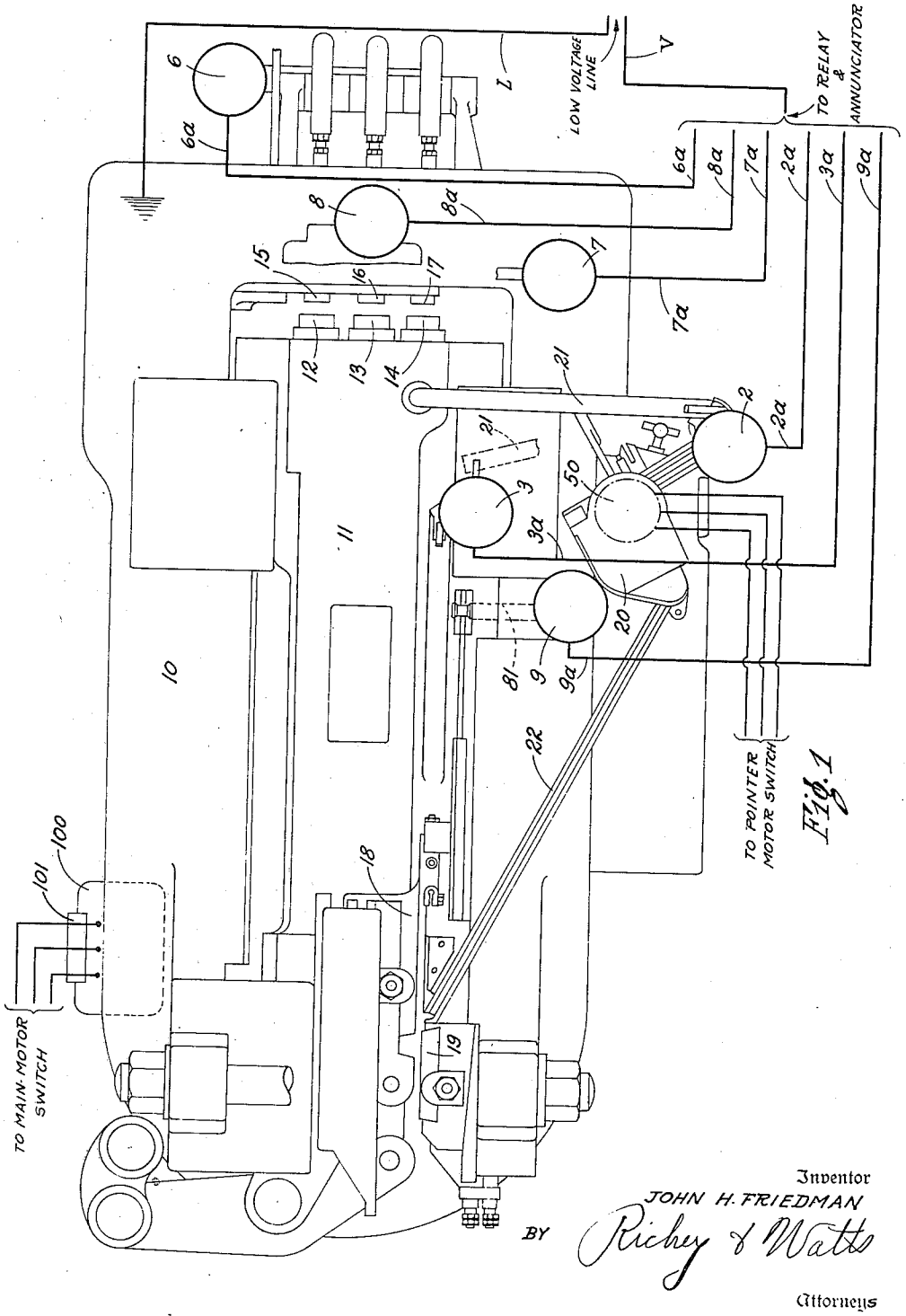


Fig. 1

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Filed Nov. 13, 1935 4 Sheets-Sheet 2

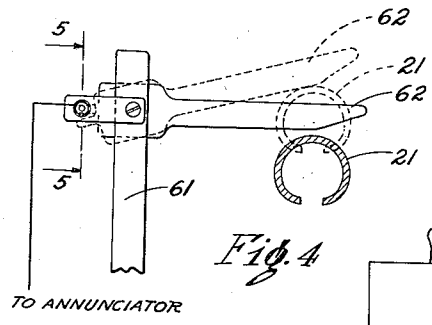


Fig. 4

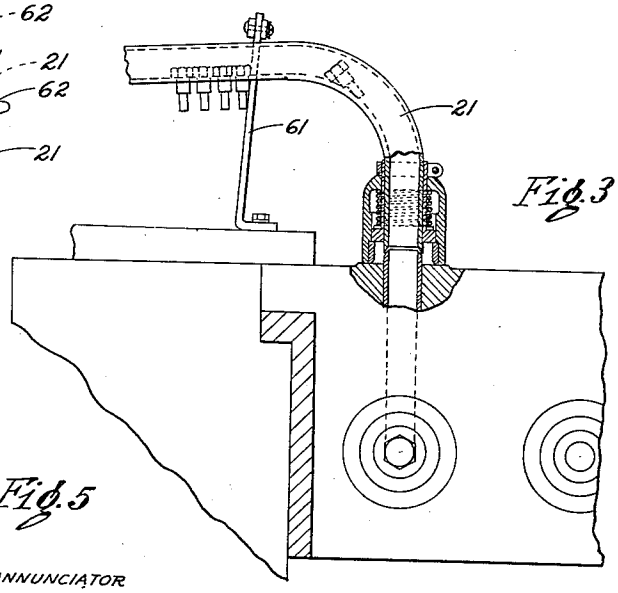


Fig. 3

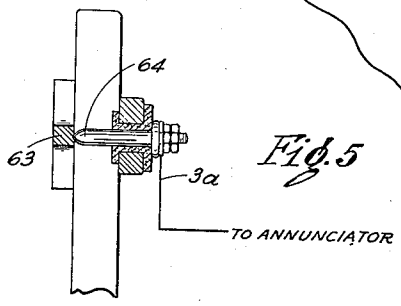


Fig. 5

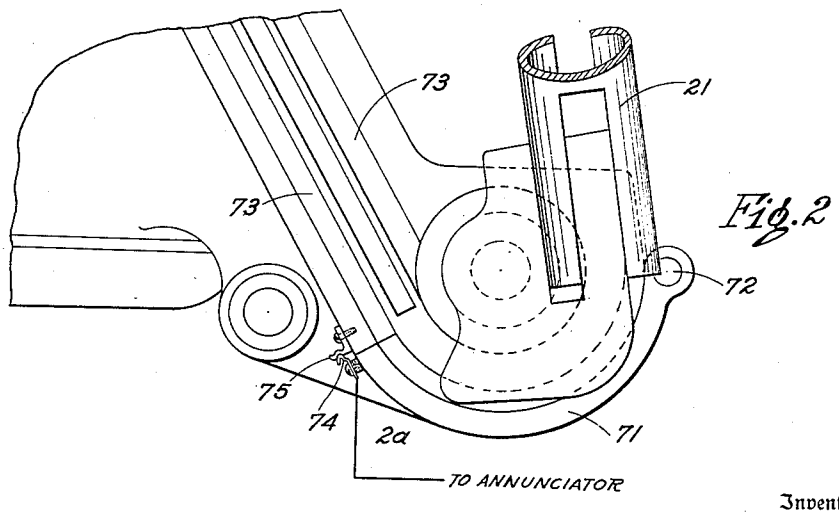


Fig. 2

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MACHINE FOR MAKING BOLTS

Filed Nov. 13, 1935 4 Sheets-Sheet 3

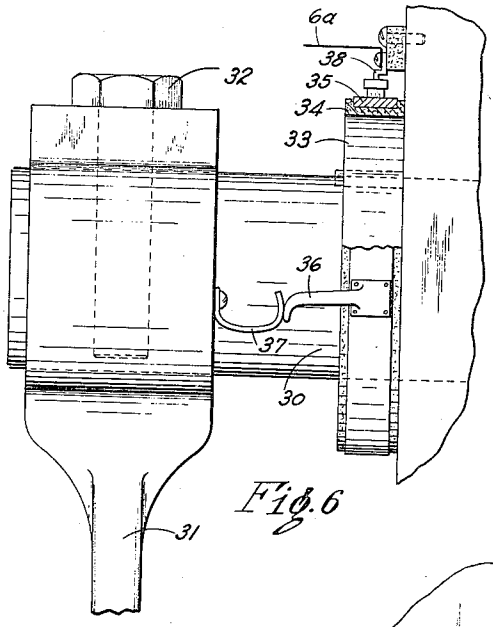


Fig. 6

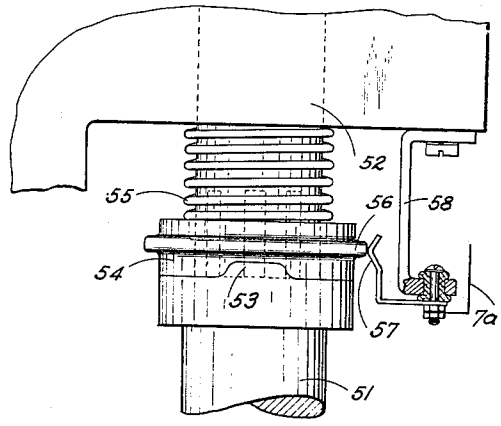


Fig. 7

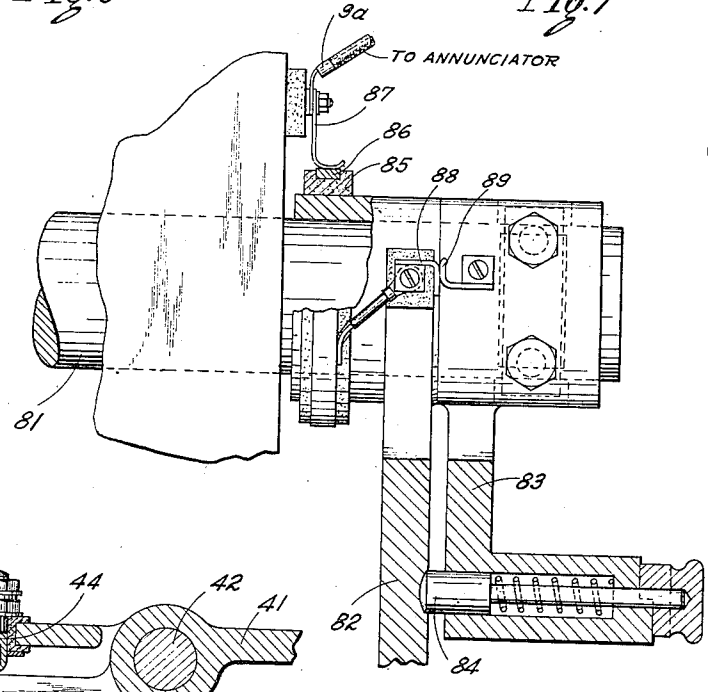


Fig. 9

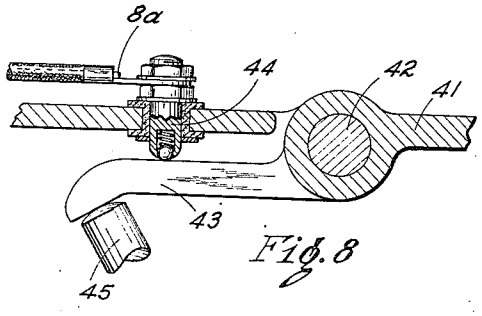


Fig. 8

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MACHINE FOR MAKING BOLTS

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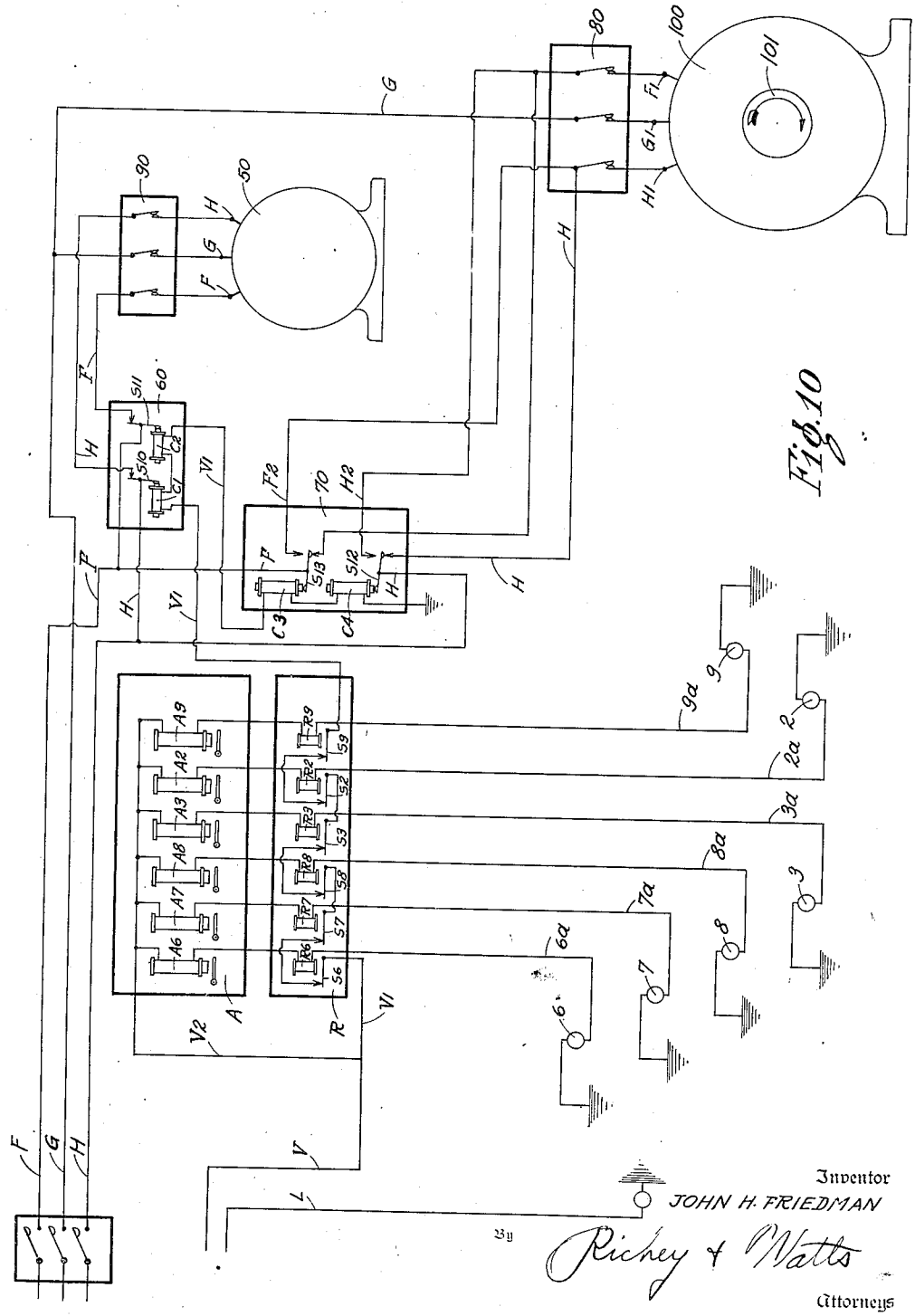


Fig. 10

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UNITED STATES PATENT OFFICE

2,104,944

MACHINE FOR MAKING BOLTS

John H. Friedman, Tiffin, Ohio, assignor to The National Machinery Company, Tiffin, Ohio, a corporation of Ohio

Application November 13, 1935, Serial No. 49,479

14 Claims. (Cl. 10—23)

This invention relates to machines for making bolts, nuts or the like and more particularly to a system of safety devices for such machines. The invention in the present embodiment is illustrated as applied to a bolt machine such as shown and claimed in the following copending applications: Earl R. Frost, Serial No. 639,054, filed October 22, 1932, Earl R. Frost, Serial No. 662,719, filed March 25, 1933, William L. Clouse, Serial No. 718,182, filed March 30, 1935 and John H. Friedman, Serial No. 712,220, filed February 20, 1934.

In machines for making bolts and the like of the type disclosed in said copending applications where a section of rod stock is sheared into suitable blank lengths and said blank lengths are operated upon by various fabricating mechanisms, it is extremely desirable that safety devices be provided to stop the machine or the particular fabricating step in the event that a bolt blank becomes jammed or misaligned, and thus prevent damage or destruction of the bolt machine. It is broadly old in various mechanical arts to provide breakable shaft pins or spring latched safety devices in the drive of various mechanisms to prevent injury to the mechanism in event of an overload or jam during the operation. In the application of such safety devices to a bolt making machine of the type disclosed and claimed in said copending applications and variations thereof wherein a relatively massive header slide reciprocates within a bed frame to head and/or extrude and/or trim a bolt blank, it will be seen that a stopping of the machine by functioning of the safety device while the header slide is in its most forward position; that is, working the blank in the dies of the bed frame will jam or lock the header slide in said forward position. The danger of such a jam will be better understood when it is appreciated that one blank may be part way extruded into the die of the bed frame and another bolt blank may be partly trimmed by a trimming punch carried in the header slide at the time that the safety device becomes operative to stop the machine and thus deprive the header slide of its momentum at a time when such momentum is essential to the completion of the extruding, heading or trimming step. Where nuts are being formed in this type of machine and the header slide permitted to stop on its forward stroke the punches or piercing tools will be locked within the nut blank and the header slide being without momentum cannot be moved by the normal force of the driving motor.

The blanks become locked in the dies by the pressure resulting from their partial working and it is frequently necessary in machines of this character in which the safety devices are adapted to function at any time during the cycle of the machine to more or less dismantle the machine in order to free the header slide and dies of the partially worked blanks. An alternative method of freeing the header slide and the bed frame dies of partially worked blanks in the event of such a jam involves the application of excessively high torque to the driving mechanism of the machine such as inserting long bars or levers in the main drive of the mechanism to force the header slide forward or withdraw the header slide from its forward position. In any event a safety device which functions to permit the header slide to stop in its most forward position requires a substantial shut-down of the machine to free the tools of partially worked blanks which is a laborious and expensive operation.

The importance of bringing the header slide to a stop on its receding movement or back center position with respect to the dies will be appreciated by a consideration of a machine without any safety devices. For instance, if subsequent to a working of the blank in a bed frame die by the header slide, an ejector pin breaks during the ejection of the blank, the transfer fingers which have been positioned to engage the ejected blank are unable to move the blank away from the die due to its partial ejection. In the absence of any release in the transfer mechanism it will be broken by the overload thus imposed and the header slide on its approach to the bed frame dies will forcibly engage a broken transfer mechanism and one or more partially ejected blanks. If the transfer mechanism were not broken in its attempt to transfer the partially ejected blank, the header slide would be approaching the bed frame dies at a time when a section of unworked blank stock was being moved in toward the dies by the cut-off and there would be one more blank between the header slide and bed frame than there were die stations which would obviously disrupt and damage the machine.

Since recent developments have resulted in machines of this type which run at high speeds and wherein the header slide acquires considerable momentum in its reciprocation, the bringing of the entire machine to a full stop in a short space of time presents considerable difficulty in conjunction with safety devices. During the cycle of the machine the most forward position and the most rearward or back center position presents the most opportune time to bring the header slide to a stop, since during this phase of the

cycle the flywheel or other moving parts must overcome the inertia or tendency of the header slide to continue its directional movement. Of said two opportune times at which to bring the header slide to a stop the most forward position is the most convenient and natural, since it is during this phase that the working of the blanks supplements the other moving parts of the machine in their action to overcome the inertia or tendency of the header slide to continue its forward movement. Heretofore safety devices have usually been operative to stop the machine on its most forward stroke and as above pointed out by illustration considerable damage results from stopping the header slide during this phase of its cycle.

It is among the objects of my invention to provide a safety mechanism for machines of the type indicated which will operate to prevent any damage to the machine and which will function to stop the machine only when the header slide is on its back stroke or away from the dies. It is a further object of my invention to co-ordinate a series of safety devices so that the functioning of any one of said devices will be effective to stop the driving force of the machine. A further object of my invention is to arrange a series of safety devices in accordance with the preceding object so that the location of the overload or jam will be visibly and/or audibly indicated to the machine operator. A further object of my invention is to provide a safety mechanism for a blank ejecting assembly which will function to stop the bolt machine only when the header slide is in a back center or retracted position. A further object of my invention is to provide a safety device for a transfer mechanism such as shown in said co-pending application to William L. Clouse, Serial No. 718,182 above referred to wherein said device becomes operative to stop the bolt machine only when the header slide is in a back center or retracted position. A further object of my invention is to provide a safety device for a pointer transfer tube and track such as shown in said copending application of John H. Friedman, Serial No. 712,220 above referred to which will become operative to stop the bolt machine only when the header slide has moved away from its most forward position. A further object of my invention is to provide a safety device for a roll threader blank feeding mechanism such as shown in the copending application to Earl R. Frost, Serial No. 662,719 above referred to. It is a further object of my invention to provide a machine of the character described with a plurality of safety devices, any one of which upon functioning will sequentially, prevent the application of a positive forward driving force to the machine, reverse the directional effect of the driving force of the machine and maintain the reversal of the directional effect of the driving force until the machine comes to a full stop. It is a further object of my invention to provide a safety mechanism for a bolt machine having a main motor and a pointer motor which will upon functioning in response to a jam or overload sequentially stop the flow of electrical energy to the pointer motor and the main motor, re-establish a flow of electrical energy in the main motor tending to turn the same in the opposite direction and maintain said last mentioned flow of energy until the machine comes to a full stop.

Further objects and advantages relating to safety and economies of manufacture will be understood from the following description and the accompanying drawings wherein:

Figure 1 is a plan view of a bolt machine diagrammatically showing the location of the various safety devices;

Figure 2 is an enlarged plan view of the safety switch applied to the blank track of a pointer mechanism;

Figure 3 is an elevation looking toward the header slide with parts in section showing the arrangement of the safety switch which cooperates with a blank transferring tube;

Figure 4 is a side elevation of the safety switch of Figure 3;

Figure 5 is a sectional view taken on line 5—5 of Figure 4;

Figure 6 is an enlarged detailed showing with parts in section of the safety switch applied to an ejector assembly;

Figure 7 is a detailed showing with parts in section of a safety switch applied to the carriage drive of the blank transferring mechanism;

Figure 8 is a sectional view of a safety switch operatively connected to the carriage support of a blank transferring mechanism;

Figure 9 is a detailed showing with parts in section of a safety switch applied to the roll threader blank feeding mechanism;

Figure 10 is a wiring diagram of the safety switch assembly as applied to a particular machine.

The objects outlined above have been attained generally by providing at various places throughout a bolt machine parts which are resiliently or otherwise mounted to respond to jams or overloads and arranging electrical contact devices between said movable parts so that an electrical circuit is maintained or broken by the relative position of the parts. In the present embodiment I have arranged the switches so that when the parts are assembled for operation of the machine a circuit will be maintained through the assembly. At another point in the circuit of each switch I have arranged a relay and an annunciator so that in the event of a jam or overload which functions to break the circuit at a particular safety switch, the effect of the broken circuit will be transmitted to the relay and to the annunciator in the same circuit. The operative effect in the relay is to break another circuit which may be referred to as a solenoid circuit and as the solenoid circuit is broken devices in the solenoid circuit operate utimately to bring the bolt making machine to a stop. An annunciator which is arranged in series with the relay is also actuated by the break in the safety switch to operate an annunciator so as to indicate to the operator of the bolt machine which of the various safety switches has brought about the stopping of the machine. Although the safety switches, relays and annunciators in the present embodiment are arranged to be actuated by a break in a circuit which is maintained through the safety switches, it will be appreciated by those skilled in the art that the devices may be arranged to be actuated upon the establishment of a circuit through the safety switches. It will also be understood from the following description that the invention is not limited to the switches, relays and other electrical apparatus described in detail but that such details are set forth to disclose a completely operative device.

In Figure 1 I have shown a bolt making machine having a bed frame 10 provided with a reciprocating header slide 11 which carries on

its forward end a series of dies or punches 12, 13 and 14 arranged to cooperate with and work bolt blanks in the bed frame dies 15, 16 and 17. The rearward portion of said header slide is provided with a roll threading die 18 arranged to cooperate with a complementary frame carried die 19, and a pointing mechanism 20 is arranged at one side of the bolt machine to point the blanks intermediate the forming of the blank and the roll threading. To transfer bolt blanks which are successively worked in the dies at the forward end of the machine from said dies to the pointer, a transfer tube 21 is pivoted to the header slide and communicates with a passageway in said header slide which receives blanks from the die 14 and maintains said blanks in head-to-tail arrangement as they are moved up into the tube 21. The underside of the tube 21 is slotted to permit the shank end of the blank to drop so as to position the blank vertically and guide the same to the pointer track. As the bolt blanks leave the tube 21 they are conducted between a pair of parallel rails or tracks and are fed into a chuck arranged within the pointing mechanism 20. A motor having a cutting tool is arranged beneath the chuck and forms a point upon the blanks as they pass successively from the heading tools through the pointer and onto the track 22 which leads to the roll threading dies. Reference is made to the above cited copending applications regarding the structure and operation of this machine and to the copending application of Friedman, Serial No. 49,477 filed November 13, 1935 with respect to the track leading from the pointer to the roll threading device and feed mechanism in said roll threader.

To indicate the location of the various safety devices making up the safety switch assembly a series of circles numbered 2, 3, 6, 7, 8 and 9 are superimposed upon the plan showing of the machine in Figure 1. Detailed showings of the devices indicated by said circles are found in the figures of the drawings which are provided with view numbers corresponding to the numbers of said circles. The same numbers are retained to identify the corresponding safety switches in the wiring diagram of Figure 10. The wires which lead from the safety switches to the relay and annunciator boxes are identified by the addition of the letter *a* to the number applied to the particular safety switch. For instance, the wire which leads from the safety switch mechanism 6 is identified by 6*a* and this notation is likewise maintained in the wiring diagram of Figure 10.

Considering the safety devices in the order in which the stock is worked in the machine, the device of Figure 6 which is applied to the ejector mechanism comprises a shaft 30 which extends generally transversely of the bolt machine and is rocked upon its axis to move a series of ejector rods to eject blanks from the dies subsequent to their working therein. The shaft 30 is actuated through the medium of a depending arm 31 which is secured to the shaft 30 by a breakable pin 32. In the normal operation of the machine the arm 31 is oscillated by a reciprocating rod operatively connected to the crankshaft of the bolt machine. Should a worked bolt blank become lodged in the bed frame dies 15, 16 and 17 or any other thing occur which would prevent the orderly ejection of the blank, the reaction will be taken through the ejector rod assembly to the shaft 30 and the resistance of the shaft 30 to turning upon its axis will shear off the breakable bolt 32. It will be understood by those skilled in the art that the arm 31 will only be forcibly actuated when the header slide is moving away from the bed frame dies, since the ejector rods would not be timed to eject the blanks at any other time.

A ring 33 is keyed to the shaft 30 and carries on its outer periphery a ring of insulating material 34 which in turn carries a collector ring 35. Secured to the collector ring 35 and projecting transversely thereof is a switch element 36 which normally contacts a cooperating element 37 which is secured to the arm 31. A brush 38 bears against the collector ring 35 and is secured through the medium of a block of insulating material to the casting or member within which the shaft 30 rotates. A wire 6*a* is connected to the brush 38 and said wire 6*a* leads through the relay box R to the annunciator box A. One side of a low voltage line L is grounded to the bed frame and the other side of the said low voltage line V leads to the relay and annunciator boxes A and R. In the embodiment illustrated the low voltage line L—V is preferably about 24 volts and the devices used in conjunction with this source of energy are shown, to simplify the description, as being operated by direct current. I appreciate, however, that alternating current responsive devices may be substituted for those shown and in that event a transformer may be interposed between the high voltage line H—F—G and the low voltage line L—V as a source of low voltage alternating current.

Following through the effect of a jam or overload in the ejector assembly such as would shear the pin 32, it will be seen that the contacts or switch parts 36 and 37 will become separated and thus the circuit which has been maintained through the bed frame as a ground for one side of the L—V line, the arm 31, the switch 37—36, the collector ring 35 through wire 6*a* and through the relay and annunciator system will be broken. The effect of breaking the circuit through 6*a* is to de-energize the relay coil R6 and de-energize the annunciator coil A6. As the coil A6 is de-energized the signal of the annunciator responds to a spring (not shown) and indicates to the operator of the bolt machine that a release has occurred in the knockout assembly. A switch S6 in the relay box is normally maintained in a closed position by the flow of current through the relay coil R6 and upon the break-down in the circuit through 6*a* the switch S6 is opened in response to a spring or similar device (not shown).

The switch S6 is one of a series of switches including S7, S8, S3, S2 and S9 in a solenoid circuit of the line V1 running through the relay box, through solenoids C1 and C2 in the pointer switch box and through solenoids C3 and C4 in the main motor switch box and terminating in a ground on the bed frame of the machine. The break down in this circuit occasioned by the opening of the switch S6 de-energizes the solenoids C1 to C4 inclusive. The de-energization of the solenoids C1 and C2 in the pointer switch box opens the high voltage line H—F through switches S10 and S11 and hence stops the flow of electrical energy to the pointer motor 50. The de-energization of the solenoids C3 and C4 in the main motor permits the switches S12 and S13 to move in response to springs (not shown) to discontinue the conduction of high voltage current through H—F to the main motor 100 tending to drive the same in a forward direction. As the switches S12 and S13 swing in response to said spring action they re-establish a high voltage circuit to the main motor 100 through lines F2

and H2 which lead to terminals H1 and F1 respectively on the main motor. In other words the movement of the switches S12 and S13 upon the de-energization of the solenoids C3 and C4 reverses the three-phase motor 100 by switching the two outside high voltage wires. This characteristic of three phase motors will be understood by those skilled in the art.

The flow of electrical energy tending to turn the motor in a direction opposite to that which drives the bolt machine forward is maintained by a motor reverse cut-out 101 until the machine ceases to move in a forward or positive direction. The motor reverse cut-out 101 functions to discontinue the flow from lines L2 and H2 into the motor at the instant the machine comes to rest. The details of the motor reverse cut-out are not shown as such devices are well known in the art and any type which will accomplish the functions I have described will be suited to carrying out the teachings of my invention.

Separate manually operated switches 90 and 80 are arranged in the pointer and main motor circuit intermediate the motors and their switches 60 and 70 so that, if desired, one motor may be operated independently of the other. For instance the machine of the character disclosed in my copending application is suited for making certain types of bolts in which the blanks are unpointed and are merely advanced through the pointer mechanism as an idle station and in making such blanks the motor 50 would be rendered inoperative by opening the switch at 90.

Referring now to the next mechanism which is provided with a safety device and operates upon the bolt blanks formed in the machine is the safety mechanism indicated by the circle 8 in Figure 1 and illustrated in detail in Figure 8 wherein a member 41 which slidably supports a transfer carriage (as will be better understood by reference to the copending application of William L. Clouse, Serial No. 713,182) is pivoted on a shaft 42 which in turn is pivotally carried by a bed frame bracket and said member 41 is provided with a rearwardly extending portion 43. The bracket which supports the shaft 42 is apertured adjacent the extension 43 and a safety switch contact 44 projects through said aperture and is insulated with respect thereto by a suitably shaped sleeve. A wire 8a is connected to the member 44 and leads therefrom to the relay and annunciator assemblies heretofore described.

In the event that the transfer fingers which grip the ejected blank as it is moved out of one die and transfers the blank to the next adjacent die should be engaged at the underside thereof by an ejected blank due to a misalignment of the blank or a misalignment of the fingers, the entire transfer carriage will be swung upwardly away from the bed frame dies on the shaft 42. This advantage of this type of transfer will be better understood by reference to said copending application of William L. Clouse, Serial No. 718,182. The upward swinging of the carriage and bracket 41 upon the shaft 42 moves the end of the member 43 downwardly against the action of a spring pressed plunger 45 and this movement breaks the circuit through wire 8a to its ground on the bed frame through member 43. The effect of breaking the circuit at this point is the same as the breaking of circuit in 6a heretofore described in that the relays break the solenoid circuit which ultimately brings the entire bolt machine to a stop. In this connection it is pointed out that the transfer carriage and fingers are swung upwardly only through the medium of an ejected blank and as will be understood said ejection takes place as the header slide is moving away from the bed frame dies. In this manner the functioning of the safety device 8 insures that the machine will not be brought to a stop when the header slide is in its most forward position and the tools and blanks therein are locked together.

The transfer drive safety device indicated by the circle 7 and illustrated in detail in Figure 7 is one which is applied in connection with a rotating shaft which effects the reciprocation of the transfer carriage. In the normal operation of the machine the shaft 51 rotates the shaft 52 through the spring pressed interlocking engagement at 53, 54 and 55. The ring portion 54 is preferably splined to shaft 52 to rotate therewith, but is free to move axially thereof against the urging of the spring 55. The ring 53 is provided with a rib 56 arranged to contact a resilient leaf or switch element 57 which is carried by a bracket 58 depending from the frame. The member 57 is insulated with respect to the frame in said bracket and a wire 7a leads from the element 57 to the relay and annunciator boxes in the same manner as wires 6a and 8a heretofore described.

When the normal reciprocation of the transfer carriage is restricted or prevented by a misaligned blank or the like, the shaft 52 and its splined ring 54 are prevented from rotating in unison with the shaft 51 and the projection 53 on the shaft 51 forces the ring 54 upwardly along its splined connection against the action of spring 55. This movement of the ring 54 upwardly moves the rib 56 up out of engagement with the switch element 57 and the circuit through the safety device is broken. Here, as in the last described safety device, the agency which restricts the carriage reciprocation is usually an ejected blank, and as in the case of said described safety device, the header slide is receding from the bed frame dies at the time that the circuit is broken. The transfer fingers are normally positioned in alignment with a bed frame die and receives a blank ejected therefrom as the header slide recedes. The fingers of the transfer grip the blank during the last phase of its ejection and transfer it to the next adjacent die during the back center motion of the header slide. If a blank improperly formed or improperly ejected sticks in the die and restrains the carriage in its reciprocation toward the next adjacent die, the safety switch immediately becomes operative to stop the machine as the header slide moves to its back center position.

The blanks which are trimmed in the header punch as the last phase of the header slide operation are conducted through a hollow passageway in the header slide and emerge from the upper side of said slide into a conduit or tube 21. As best illustrated in Figure 3 the conduit 21 is pivoted to the header slide through a resilient sliding connection which permits the conduit to move upwardly if a jam should occur in the conduit 21. Trimmed blanks being advanced upwardly to the conduit 21 tend to move the conduit upwardly against the action of the spring at its pivoted header slide connection and the safety device indicated at circle 3 is designed to take advantage of this upward movement of the tube 21 to stop the machine. A bracket 61 is fixed to a header slide bearing cap or to a fixed posi-

tion of the bed frame and supports at its upper end a pivoted lever 62 which projects forwardly in a manner to overhang the transfer tube 21 when the header slide is in a back center position. The lever 62 is extended rearwardly beyond its point of connection with support 61 as at 63 and said portion 63 cooperates with a bracket carried switch element 64 to maintain a circuit through wire 3a. If the transfer tube 21 becomes filled or jammed with bolt blanks, the tube 21 will be raised to the dotted line position of Figure 4 and in this raised position moves the portion 63 away from the switch element 64. This movement operates to break the low voltage circuit through the wire 6a which is connected to element 64 and the relay annunciator and solenoid circuits operate as heretofore described in connection with safety devices 6, 7 and 8. In this safety switch as in 6, 7 and 8 the machine is brought to a stop on back center motion of the header slide and there is no opportunity for the header slide tools to jam or lock any bolt blanks in the bed frame dies.

As the bolt blanks are moved from the slotted portion of the tube 21 they are received by a track which leads downwardly to a pointer mechanism as will be better understood by reference to said copending application of John H. Friedman, Serial No. 712,220. The upper portion 71 (see Figuse 2) of said track is arcuate in shape and is pivoted at 72. The bolt blanks are moved along this arcuate portion by the action of the transfer tube 21 in its oscillating movement and said tube attains its maximum advance along the track 71 when the opening in the header slide is opposite the pointer track. As will be seen in Figure 1 the header slide is moving away from the bed frame dies and is approaching its position of maximum advance along the blank track 71. If the blank track 71 and the inclined portion 73 leading downwardly therefrom toward the pointing chuck should be filled with blanks due to a jam or overload in the pointer feed or chuck, the movement of the last blank on to the flat portion 71 of the track will take place at the time of the maximum advance of tube 21. The effect of the movement of said last blank into the track 21 is to swing the pivoted section 71 upon its pivot 72 against the action of a spring or analogous means (not shown) and thus prevent the forcing of blanks into the track 71 or 73 which might damage the pointer or the tube 21.

A block of insulating material is mounted adjacent the juncture between the pivoted section 71 and the fixed section 73 of the track and carries thereon a safety switch element 74 which cooperates with a complementary shaped ground element 75. A wire 2a leads from the element 74 to the relay and annunciator boxes and functions to actuate said mechanisms and motor switches in a manner heretofore described.

From the above description of the safety device on the pointer track it will be observed that it is a receding movement of the header slide which provides the maximum advance of the tube 21 along the track 71 and thus the safety device becomes operative to stop the machine only during a receding movement of the header slide.

After being pointed the blanks are preferably led to the roll threading dies 18 and 19 by means of a track 22 and are arranged in a position between said roll threading dies by a blank feeding mechanism preferably constructed according to my copending application Serial No. 49,477, filed Nov. 13, 1935.

To actuate said blank feeding mechanism at the roll threading end of the track 22, a shaft 81 is operatively connected to the driving mechanism of the bolt machine. As shown in Figure 9 and in said mentioned copending application of Earl R. Frost, Serial No. 662,719, the shaft 81 is rocked upon its axis by means of the oscillating arm 82. A safety latch arm 83 is adjustably secured to the shaft 81 and the oscillations of the arm 82 are transmitted to latch arm 83 through the medium of the safety latch 84. A sleeve on the arm 82 surrounds the shaft 81 and carries on its outer periphery an insulated ring 85 which in turn carries a collector ring 86. Mounted upon the bed frame through the medium of an insulated block is a brush 87 arranged to contact the collector ring 86. The wire 9a leads from said last named brush to the relay and annunciator boxes. A pair of cooperating safety switch elements 88 and 89 are carried by the oscillating arm 82 and the latch arm 83 respectively.

The switch element 88 is connected to the collector ring 86 and in the normal operation of the blank feeding mechanism the latch 84 maintains switch elements 88 and 89 in contact. When, however, an overload or jamming of the blank feeding mechanism at the roll threader occurs the shaft 81 will be restrained thereby and the lever 82 will pull away from the safety latch 84. This moves the safety switch element 88 out of contact with the ground element 89 and the circuit through the wire 9a is broken effecting a stopping of the machine. Since the blank feeding mechanism is arranged to urge a bolt blank into position between the roll threading dies only at a time when the header slide is moving to its back center or roll threading position, the operation of the safety device 9 will stop the machine on said back center position.

From the foregoing description it will be observed that I have provided a machine for making bolts and the like with a plurality of mechanical safety devices and that I have combined with each of said mechanical safety devices a switch which maintains through electrical circuits a constant control over the motors of the machine. In the embodiment illustrated the wiring arrangement is not only a safety assembly which will protect the machine, but the assembly serves as a check upon the condition of the electrical safety devices as well. For instance, each of the wires, 6a, 7a, 8a, 3a, 2a and 9a and their relays serve the double function of maintaining the circuit which keeps the machine operating and also serve as a check upon the condition of the wiring itself, since a break in any of the circuits such as would be caused by an accidental severing or breaking of one of the wires would operate to stop the machine and indicate through the annunciator which wire or relay was broken or defective. In other words, there is constant evidence in a "safe" signal in the annunciator that each of the wires leading to the various safety devices are in good condition and performing the function for which they are designed. The assembly is relatively inexpensive to construct since it requires but one wire from each of the safety devices and is inexpensive to maintain since the switch parts require no independent re-adjustment or replacement subsequent to their separation.

Although I have illustrated and described one embodiment of my invention in considerable detail and since variations therefrom may be made by those skilled in the art without departing from

the spirit of the invention, I desire to be limited by the appended claims when given the range of equivalents to which my patent may be entitled rather than by the specific embodiments disclosed.

I claim:

1. A machine for making bolts or the like having a co-operating bed frame and reciprocating header slide tools, an electric motor to drive said machine, a safety mechanism on said machine arranged to reverse the directional force or rotation of said motor upon mechanism actuation, and means to discontinue the application of said reversing force upon the stopping of said machine.

2. A machine for making bolts or the like having a reciprocating header slide provided with tools and a bed frame provided with co-operating tools, electric motor means to drive said machine, a safety mechanism on said machine arranged to be actuated upon overload or jam in the machine, said safety mechanism operative upon actuation to sequentially discontinue the conduction of electrical energy to said motor to tend to drive said motor in a forward direction, conduct electrical energy to said motor tending to drive said motor in a direction opposite normal forward drive and discontinue the application of said last named motor reversing force upon the stopping of the machine.

3. A machine for making bolts having a bed frame and a reciprocating header slide, provided with co-operating tools and a high voltage line connected with an electric motor adapted to drive said machine, a low voltage line having safety devices in its circuit to control switches in said high voltage line, means to actuate said safety device when said header slide is in a back-center position, said last named means inoperative to actuate said devices when said header slide is in a forward position whereby, in the event of an overload or jam, said safety devices function thru the motor to stop the machine on a back-center position.

4. In a machine for making bolts, having a bed frame and a header slide, each provided with a plurality of co-operating dies, means to eject bolt blanks from said dies and transferring means to move a bolt blank from one die to the next adjacent die, a safety mechanism operatively connected to said ejector means and transferring means and to the prime mover of said machine, said mechanism operative to bring the machine to a stop during a receding movement or back-center position of said slide, said mechanism being inoperative to stop said machine during an approaching or forward center position of said slide with respect to said bed frame dies.

5. A machine for making bolts or the like, having a bed frame provided with a plurality of dies and a reciprocating header slide provided with tools or punches to co-operate the said bed frame dies, a pointer mechanism arranged to point the blanks formed by said bed frame and header slide tools, means to transfer the blanks from said bed frame dies to said pointer mechanism, a main motor to drive said header slide and a motor to drive said pointer, high voltage lines running to said motors, safety mechanism operatively connected to said transfer means, a low voltage line operatively connected to said safety mechanism and to switches interposed in said high voltage line whereby said safety mechanism is arranged upon actuation to discontinue the high voltage circuit to said motors thru said switches, re-establish a high voltage circuit to said main motor in a manner tending to reverse the direction of rotation of said motor and maintaining said last mentioned circuit until the machine comes to a stop.

6. In a safety mechanism for a bolt making machine or the like, having massive moving parts, a high voltage line provided with switches connected to a main driving motor for said machine, a low voltage line connected to a safety assembly for controlling said main motor switch, a safety switch mounted on said machine and operatively connected to moving parts thereof and arranged to be actuated by an overload or jam therein, said last named switch during the normal operation of said machine arranged to maintain a low voltage circuit thru a relay and thru an annunciator, a solenoid operatively arranged with respect to said main motor switch energized by a low voltage line having switches therein controlled by said relay, whereby actuation of said safety switch upon overload deenergizes said relay and annunciator, the deenergization of said relay operative to open said solenoid circuit and the switch controlled thereby to stop said machine.

7. A machine for making bolts and the like having a reciprocating header slide and a plurality of mechanisms adapted to carry out different fabricating operations upon the bolt blank, means to move a bolt blank from one fabricating mechanism upon the completion of the operation therein and advance the same toward the next fabricating mechanism, comprising a member moving in timed relation to said header slide and operative to move the bolt blank upon a receding movement or back center position of said header slide, a safety mechanism operatively connected to said member and actuated in response to an overload or jam in said means to discontinue the blank moving action of said means, and of said header slide and said mechanisms.

8. A machine for making bolts and the like having a reciprocating header slide and a plurality of mechanisms adapted to carry out different fabricating operations upon the bolt blank, means to move a bolt blank from one fabricating mechanism upon the completion of the operation therein and advance the same toward the next fabricating mechanism comprising a member moving in timed relation to said header slide and operative to move the bolt blank upon a receding movement or back center position of said header slide, a safety mechanism operatively connected to said member and actuated in response to an over-load or jam in said means to discontinue the blank moving action of said means, a safety switch operatively connected to said means and to the prime mover of said machine actuated by the disruption of the blank moving action therein to stop said motor.

9. A machine for making bolts or the like comprising co-operating header slide and bed frame dies, an ejector assembly to eject a bolt blank from said dies subsequent to its working therein, said assembly arranged to move worked blanks out of the dies as the header slide recedes with respect to the bed frame dies, means to advance said ejector into said dies as the header slide recedes and a safety device interposed between said means and said ejector responsive upon over-load or jam in said ejector to disengage said means and ejector to discontinue said advancing action, a safety switch operatively con-

nected to said means arranged to stop a movement of the header slide upon said disengagement.

10. In a machine for making bolts or the like, a bed frame having dies therein and a reciprocating header slide having tools arranged to cooperate with said dies, a main motor connected through switches to a high voltage line to actuate said header slide, ejector mechanism arranged to move worked bolt blanks from said dies upon a receding motion or back center position of said header slide, driving means operatively connected to said motor to actuate said ejector, a safety device arranged in said ejector drive responsive to an over-load or jam in said ejector to discontinue the application of any driving force, a safety switch carried by said device normally operative to maintain a control circuit connected to said main motor switch, said safety switch actuated by operation of said safety device to break said circuit and thereby open said main motor switch to stop the machine.

11. A machine for making bolts or the like having a reciprocating header slide, a series of pairs of co-operative tools carried on said bed frame and header slide, means to transfer blanks from one pair of tools in said series to the next adjacent pair comprising gripping fingers adapted to grip a blank as it is being ejected from one die and transfer and align the blank with the next adjacent die, said transfer fingers mounted to move with respect to the dies in event they are forcibly engaged by a misaligned blank, a safety switch operatively connected to said transfer means and to the prime mover of said machine actuated by said last named movement to stop said machine.

12. A machine for making bolts or the like having a bed frame and a reciprocating header slide, co-operating tools carried by said bed frame and header slide, means on said header slide to receive a blank subsequent to the last operation effected by said co-operating tools, a transfer tube resiliently connected to said header slide and bed frame adapted to conduct bolt blanks from said means to a fixed point on the bed frame, said transfer tube arranged to be moved with respect to said header slide through said resilient connection by incoming blanks in the event of a jam or over-load in said tube, a safety switch arranged to be moved by said tube when the tube is moved with respect to the header slide through said resilient connection, said safety switch operatively connected to the prime mover of the machine and operative when moved by said tube to stop said machine.

13. In a machine for making bolts or the like, a plurality of mechanisms adapted to perform different fabricating operations upon bolt blanks, a safety assembly for said machine comprising a plurality of safety devices connected to said mechanisms each comprising a safety switch maintained in one position during the normal operation of said mechanisms and adapted to be moved to another position by an overload or jam in said mechanisms, a main motor to drive said machine, a power line having switches therein connected to said motor, a safety switch line connected to said safety switches and through a relay to an annunciator, a control line connected through said relay to a motor switch control device, each of said safety switches moved in response to an overload or jam in its respective mechanism to actuate said relay and said annunciator, said relay actuation operative to actuate said switch control device and stop said motor, said annunciator actuation operative to signal to the machine operator which mechanism effects the stopping of the machine.

14. In a machine for making bolts having a header slide, a plurality of mechanisms adapted to perform different fabricating operations upon bolt blanks, a safety assembly for said machine comprising a plurality of safety devices connected to said mechanisms, each of said safety devices comprising a safety switch maintained in one position during the normal operation of said mechanism and adapted to be moved to another position by an over-load or jam in said mechanism, a main motor arranged to drive said machine and reciprocate said header slide, and a power line having switches therein connected to said motor, each of said mechanisms operatively connected to move in timed relation with said header slide, a safety switch line connected to the safety switches of each of said mechanisms and to an annunciator, said safety switch line also operatively connected to said power line switch, said safety switches arranged to be moved in response to an overload or jam only when said header slide is in a back center or receding position, said last named safety switch movement effective to operate said power line switch and stop said motor and operate said annunciator to signal to the machine operator which mechanism initiated the stopping of the machine.

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